

In-Office Cost System (IOCS) Documentation

I. PREFACE

A. Purpose and Content

USPS-FY19-37 documents the In-Office Cost System, including statistical design for and estimation of in-office labor costs. It also presents FY19 CVs (coefficients of variation) and confidence intervals for the estimates.

B. Predecessor Document

Documentation of statistical design and estimation were provided previously in Docket No. R2006-1, USPS-LR-L-9 and ACR2018, USPS-FY18-37.

C. Corresponding Non-Public Document

USPS-FY19-NP21, In-Office Cost System (IOCS) Documentation.

D. Methodology

For FY19, IOCS methodology is the same as described in Docket ACR2018: USPS-FY18-37, except for the changes listed below.

Following Order No. 4972 (January 8, 2019), Docket No. RM2018-5, TACS data are now used to develop the costs for carriers on holidays in addition to Sundays.

The panel of finance numbers for CAG C was rotated in FY2019.

In FY2019, new questions were added to the data collection instrument to obtain additional data about shape when carriers are handling mail, but the specific mailpiece could not be obtained for recordation. These situations arise most frequently when carriers are in the parking lot and are handling hampers. The distribution of mixed-mail tallies using this additional shape information resulted in significant shifts in the shares of costs allocated to products, most noticeably for parcel-shaped products.

E. Input/Output

Cost estimates from the In-Office Cost System rely on no input data. Outputs from the In-Office Cost System are used as inputs to:

USPS-FY19-1	• FY 2019 Public Cost and Revenue Analysis (PCRA) Report
USPS-FY19-7	• Cost Segment 3 Cost Pools & Other Related Information (Public Portion)
USPS-FY19-19	• FY2019 Delivery Costs by Shape
USPS-FY19-31	• FY 2019 CRA Model (Model Files, Cost Matrices, and Reports) (Public Version)
USPS-FY19-32	• FY 2019 CRA "B" Workpapers (Public Version)

II. ORGANIZATION

This document describes the statistical design of IOCS, and provides information on the system's programs. Electronic data files, programs, data dictionary, flowchart and CVs are provided in the accompanying zip file, described in Appendix A.

III. OVERVIEW

The In-Office Cost System (IOCS) is a continuous, ongoing probability sample of work time to estimate costs of various activities performed by clerks, mail handlers, city carriers, and supervisors. Although the Postal accounting system tracks costs for various categories of employees, it does not identify labor costs by individual product because employees are simultaneously processing more than one product in most operations. The IOCS is designed to supplement the accounting system data by sampling employees at randomly selected points in time throughout the year. When an employee is sampled, the activity of the employee at that point in time is recorded directly into a laptop computer using the IOCS Computerized On-Site Data Entry System (IOCS-CODES) software.

These sample data, in combination with data from the accounting system and the MODS system, are used to produce detailed estimates of attributable costs for various activities.

A. Use of IOCS Data in Distribution of Costs to Mail Categories

IOCS estimates are used to distribute volume variable costs to products for cost segments 3 (clerk/mail handler-CAG A-L Post Offices) and 6 (city carrier, in-office). The data are generally tabulated at the "cost pool" level for costing purposes; see USPS-FY19-7.

B. Other Uses of IOCS Data for Costing

Cost estimates from the IOCS are also used to develop accrued costs for segment 2 (supervision of mail processing, window service, admin support...), segment 6 (city carrier in-office), and segment 7 (city carrier street time). For example, the accounting system provides total accrued costs of city carriers (Cost Segments 6 and 7 combined), and an IOCS estimate of the proportion of city carrier cost while in the office is used to split accrued costs between segments 6 and 7.

In addition, the distribution of volume variable costs in other segments and components relies indirectly on IOCS. For example, volume variable rental costs for window service space are distributed as window service in segment 3.2, and the volume variable costs of segment 3.2 are distributed to products based on IOCS estimates.

Documentation for the In-Office Cost System provided in USPS-LR-L-9, Docket No. R2006, included complete programs and descriptions of field data collection processes and data editing.

Those programs and descriptions have incurred no substantive changes and are not reproduced herein.

IV. STATISTICAL STUDY DESIGN

The universe under study in IOCS consists of all the work time, during a Fiscal Year, of all employees in four employee crafts: 1) Clerks, 2) Mail Handlers, 3) City Carriers, and 4) Supervisors.¹ The IOCS is a three-stage probability sample of employee work time, stratified by employee craft and by Cost Ascertainment Group (CAG). The details for each of the stages are described below:

A. First Stage Sample

The first stage sampling unit is a post office or plant, represented by a lead finance number. The IOCS office frame consists of all lead finance numbers that contain employees eligible for sampling in IOCS, together with their associated stations, branches and remote post offices. Finance numbers are stratified by size into CAGs, where the measure of size for each office is its total revenue two years previous. The office frame consists of finance numbers whose CAG status is at L or above. Stations and branches have the same CAG as their lead finance number, while remote post offices retain their own CAG. The Network Distribution Centers (NDC) and processing and distribution facilities (P&DC, AMC, AMF and some P&DF) are considered as part of the stratum of largest (CAG A and B) offices.

All offices that were in CAG A or CAG B prior to 1992 and remained in CAGs A or B are included in the sample. In each of the other CAGs, a panel of offices is used to represent the office frame.

Table 1 summarizes the first-stage sample and universe sizes.

Table 1: First-Stage Universe and Sample		
Fiscal Year 2019		
CAG Group	Office Frame	Sampled Offices
A/B	2,849	2,482
C	1,398	373
D	818	130
E	1,598	90
F	2,185	85
G	3,178	135
H/J	8,344	567
K/L	6,603	367
Grand Total	26,973	4,229

¹ This group includes professional, administrative and technical staff.

B. Second Stage Sample

The second stage sampling unit is the employee-week. Employees are stratified by craft within CAG. Sampling rates are specific to craft-CAG combinations. In order to generate more accurate cost estimates for international products, clerks and mail handlers in offices with high volumes of international mail are sampled at higher rates. Within each office, a higher sampling rate is assigned to a group of pay locations with a historically higher incidence of handling international mail. For these offices, the weekly employee sampling rates ranged from 0.03 to 0.50, as compared to the default rate of 0.03 for CAG A clerks and mail handlers.

Table 2 summarizes the employee sampling rates and Table 3 shows the sample sizes by craft and CAG group.

Table 2
Employee Sampling Rates by CAG and Employee Craft

CAG	Clerk - Regular	Clerk - Other	Mail- Handlers	City Carrier - Regular	City Carrier - Other	Super- visors
A/B & NDCs	.03	.03	.03	.024	.024	.04
C	.09	.09	.09	.073	.073	.10
D	.17	.17	.17	.138	.138	.10
E	.24	.24	.24	.194	.194	.16
F	.50	.50	.50	.405	.405	.40
G	.50	.50	.50	.405	.405	.50
H/J	.50	.50	.50	.405	.405	.50
K/L	.50	.50	.00	.00	.00	.00

Table 3: Number of Readings, Craft by CAG Group
Unweighted Tallies

Excludes Generated Records

Note: BF4 includes nonscheduled leave, samples not received, at lunch, etc.

CRAFT		A/B	C	D	E	F	G	H/J	K/L	Grand Total
1A Supervisor		16,882	3,542	1,244	1,114	837	468	102		24,189
1B Supervisor	BF4	12,654	2,503	892	742	626	392	49	13	17,871
2A Clerk-Reg		49,582	7,795	5,201	4,419	2,578	1,256	2,290	2,306	75,427
2B Clerk-Reg	BF4	58,444	6,442	4,283	3,499	2,019	1,029	1,961	1,123	78,800
3A Clerk-Sub		9,368	1,503	1,060	1,248	2,092	2,527	6,491	5,924	30,213
3B Clerk-Sub	BF4	13,611	1,424	1,101	1,235	2,273	3,040	8,771	2,886	34,341
4A Mail Handler		33,686	235	174	62					34,157
4B Mail Handler	BF4	45,903	240	165	38			1	1	46,348
5A Carrier-Reg		43,581	24,653	15,763	11,989	5,505	1,917	855	15	104,278
5B Carrier-Reg	BF4	34,622	17,937	11,044	8,461	3,927	1,264	577	6	77,838
6A Carrier-Sub		9,971	5,886	3,885	3,120	1,903	1,166	679	35	26,645
6B Carrier-Sub	BF4	9,020	4,831	3,217	2,571	1,706	1,269	853	13	23,480

Grand Total	337,324	76,991	48,029	38,498	23,466	14,328	22,629	12,322	573,587
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C. Third Stage Sample

The third stage of selection is the instant of time, within the selected week, for which the employee is scheduled for observation. Within the selected week, a day is first selected randomly with the probability proportional to the number of employees who work that day. The selection probabilities are 15/90 for a regular working day (Monday to Friday), 11/90 for Saturday, and 4/90 for Sunday. Then, within the selected day, the employee's scheduled reading period is determined by a random selection of a two-hour interval (first, second, third, or last) over the employee's actual tour of duty. For supervisors, clerks, and mail handlers, the probability of selection is (5/21, 5/21, 5/21, 6/21) respectively. For carriers, the probability of selection is (5/17, 5/17, 1/17, 6/17). Finally, a random time is selected within the selected interval with a probability of 1/120.

D. Cost Estimation

The IOCS cost weighting factor is derived from standard design-based weights and national level accrued quarterly cost data for the crafts eligible for IOCS sampling. The cost weighting factor is constructed so that weighted sums of IOCS data produce cost estimates consistent with trial balance accrued costs by quarter.

1. Design Based Weight

The design based weights, W_{hijk} , are developed from the sampling design:

$$W_{hijk} = \frac{1}{P_h} * \frac{1}{P_{hijk}} * \frac{1}{P_D} * \frac{1}{P_R} * \frac{1}{P_T}$$

where

P_h = n_h / N_h , the ratio of sample offices, n_h , to total offices, N_h , for CAG group h

P_{hijk} = weekly sampling rate for employee k at pay location j, craft i, CAG group h,

P_D = selection probability for the day of week

P_R = selection probability for the reading period

P_T = selection probability for the instant of time for observation

W_{hijk} = design based weight for employee k at pay location j, craft i, CAG group h

2. Cost Weighting Factor

The cost weighting factor "COST-BASED WEIGHT" is a dollar weight. Total accrued cost for the stratum is distributed to each employee in proportion to the employee's design weight relative to the total design weight for the stratum.

$$CW_{hijk} = \frac{W_{hijk}}{\sum_j \sum_k W_{hijk}} C_{hi},$$

where

CW_{hijk} = cost-based weight for employee k at pay location j , craft i , CAG group h , and C_{hi} = accrued cost for craft i , CAG group h .

3. The Heavy/Light Weight

For computational purposes, a relative or scaled design based weight, the Heavy/Light weight, is saved on the data record and used for computing the cost weighting factor. The Heavy/Light weight is the ratio of the design weight W_{hijk} to a standard weight.² Its value is one for regular observations, and varies for observations which were selected with probabilities different than the standard probability within a CAG/Craft group. For example, if employees in a particular CAG/Craft group are normally selected with probability 0.03, but employees in one pay location are selected with probability 0.06, then the heavy/light weight for employees in that pay location would be $\frac{1}{2}$, since weights are the reciprocals of the probabilities of selection.

As shown below, the use of this heavy/light weight rather than the design weight does not affect the value of CW_{hijk} , since the standard weight is the same for all observations within a CAG/Craft group.

Let

W_{hi}^s = the standard weight for CAG group h craft i , and

$W_{hijk}^* = W_{hijk} / W_{hi}^s$ = the heavy/light weight.

Then substituting W_{hijk}^* for W_{hijk} in the formula for CW_{hijk} , above, yields

$$CW_{hijk} = \frac{W_{hijk}^*}{\sum_j \sum_k W_{hijk}^*} C_{hi} = \frac{(W_{hijk} / W_{hi}^s)}{\sum_j \sum_k (W_{hijk} / W_{hi}^s)} C_{hi} = \frac{W_{hijk}}{\sum_j \sum_k W_{hijk}} C_{hi}.$$

The method of estimation assumes that the sample of offices in each CAG group constitutes an equal probability sample. It also assumes nonresponse is random, or independent of what is being estimated, and can therefore be regarded as constituting a simple reduction in sample size.

² The standard weight for an observation that is tabulated in CAG group x refers to the design weight of an observation sampled at a CAG group x facility without pay location over-sampling, with reading number 1 or 2, and scheduled for Monday to Friday.

4. Route group adjustment for carriers

Census workhour data from TACS are used to adjust the tally cost weights between letter routes and Special Purpose route (SPR). Adjustment factors are the ratio of the percentage of TACS workhours (WH) for each route group to the corresponding percentage of IOCS cost weights. The adjustment factors Adj_{hi}^r for route group r for CAG h and carrier subgroup i are

$$Adj_{hi}^r = \frac{WH_{hi}^r}{\sum_r WH_{hi}^r} \times \frac{\sum_{hijk} CW_{hijk}}{\sum_{r(h,i,j,k) \in r} CW_{hijk}}$$

where $r(h,i,j,k)$ is the route group to which the sampled carrier was assigned at the time of the reading. For tallies in each route group r , adjusted cost weights are

$$CW_{hijk}^r = Adj_{hi}^r \times CW_{hijk}$$

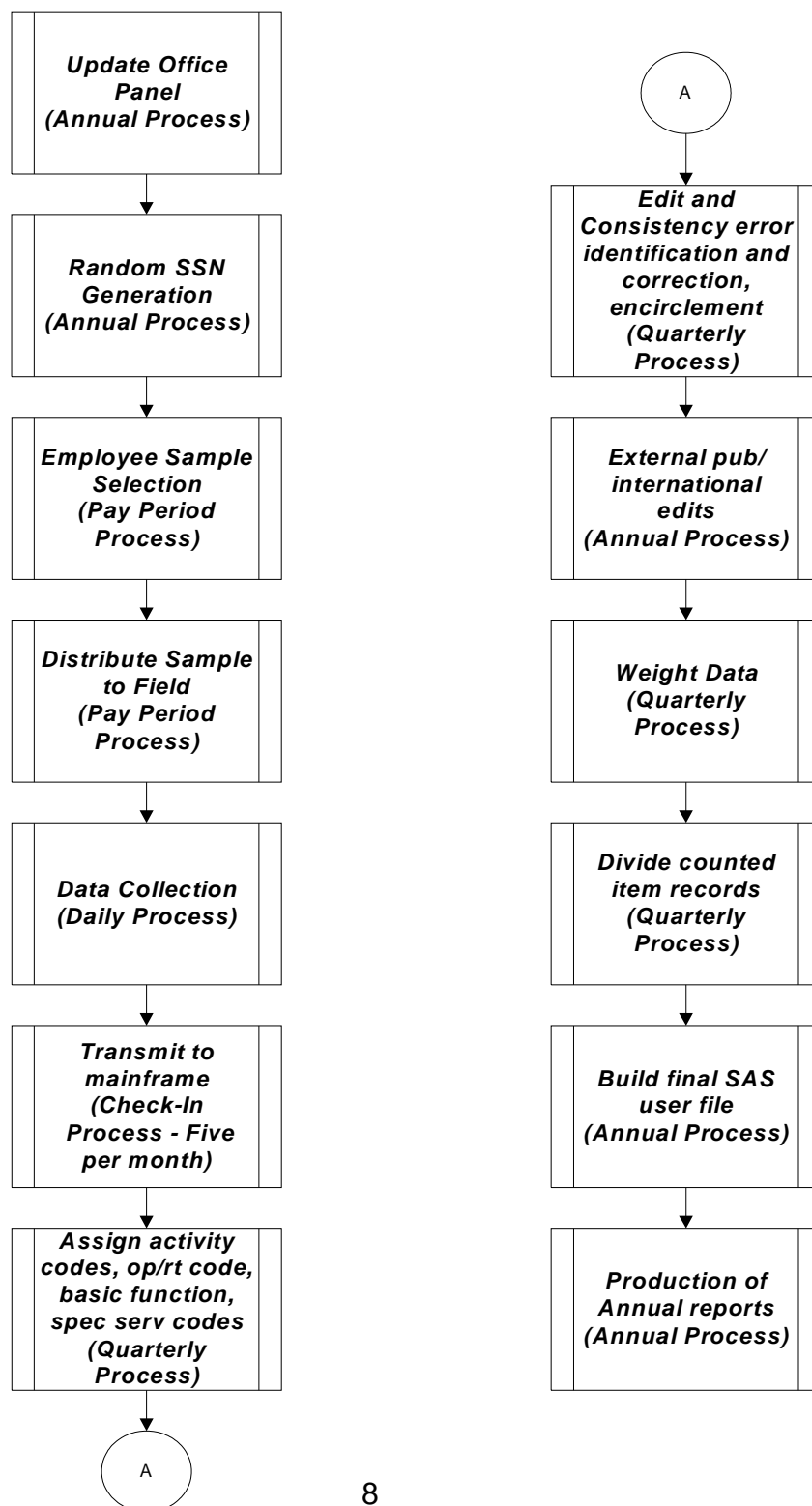
When there are no tallies available for a particular combination of CAG, craft group and route group (i.e, an empty cell), the data from two or more CAGs are combined and adjustment factors applied to the CAG group.³ Adjustment factors are developed for carrier tallies on weekdays (Monday to Saturday, excluding Sundays and holidays). Costs for carriers on Sundays/holidays are developed based on TACS workhours.

³ The methodology for grouping CAGs is specified by the Commission in Library Reference PRC-LR-RM2017-9/1.

V. SYSTEM FLOWCHART

The IOCS processing flow consists of many processes that occur at various frequencies throughout the year. The following flowchart diagrams the order of major processing steps and their frequency within an annual processing cycle.

IOCS System Flowchart



VI. PROGRAM DOCUMENTATION

The programs that assign activity codes, basic function, operation/route codes and that perform cost estimation, together with programs that summarize TACS workhours, are documented in this section. Copies of the SAS programs and JCL are provided electronically in the accompanying zip file.

ALB040 - Program

The central function of this program is to assign initial four-digit activity codes for labor activities or products and to assign up to five special service codes. In addition, it assigns initial basic function and operation/route codes.

Inputs are:

- IOCS tally data;
- Periodicals data (ISSN, Publication No.);
- ZIP Code to County mapping;
- Postal Rates;
- Barcode Service Type Code mappings.

Output is a file of IOCS tally data with activity code, basic function and operation/route codes assigned, and with coded extra services.

ALB060 - Program

The main function of this SAS program is to perform edit and consistency checking. It checks the validity of certain data and checks certain related fields within the record for consistency. Records that fail the checks are assigned an error code and written to an error file for later correction, while remaining records are written to a "clean records" file. This program is applied several times in an iterative cycle with program ALB078.

Inputs are:

- IOCS tally data, either from ALB040 or from ALB078;
- Finance numbers in the IOCS panel;
- Tables of activity codes, extra service codes, operation/route codes, and country codes.

Output consists of two files, one with tallies that are clean, and one with tallies with data inconsistencies to be resolved.

ALB078 - Program

This is a SAS error correction program. Its purpose is to resolve data inconsistencies that lead to the error codes assigned by ALB060. It is applied several times in an iterative cycle with program ALB060.

Input is the file of tallies with data inconsistencies from ALB060. Output is a file of these tallies with updates and corrections.

ALB080 - Program

This program applies encirclement rules, assigning costs to extra services when appropriate. The previous activity code of the parent piece is overwritten, replaced by the activity code of the encircled extra service.

Inputs are the files of tallies output from programs ALB060 and ALB078.

Outputs are the IOCS tallies with activity codes encircled when appropriate, in both SAS and flat files.

External review

Tallies are also reviewed externally. These checks include: validation of Periodicals titles; specialized validation of international mail checking postage, markings and barcodes; validation of data using scanned barcodes, and review of anomaly log entries.

TACSUMQX

The function of the **TACS Summary Quarterly** (TACSUMQX) program is to summarize TACS data by day of the week, base craft group, craft group, finance number, LDC group, and time split.

Inputs are files of individual TACS workhours records.

Outputs are summaries of TACS workhours for each finance number, in both SAS and flat files.

CAGTACQX

The function of the **CAG TACS Quarterly** (CAGTACQX) program is to 1) map finance numbers to CAG and 2) summarize TACS data by CAG. The data is summarized by day of the week, base craft group, craft group, LDC group, time split, and CAG.

Inputs are:

- TACS workhour summaries by finance number from TACSSUMQX;
- Lists of finance numbers with corresponding CAG.

Outputs are summaries of TACS workhours by CAG, in both SAS and flat files.

ALB101 Program

The central purpose of this program is to produce IOCS cost weighting factors. It also merges in the results of the external international edit and the external Periodicals review, and performs corrections to some activity codes. The IOCS cost weighting factor is derived from standard design-based weights and national level accrued quarterly cost data for the crafts eligible for IOCS sampling. The cost weighting factor is constructed so that weighted sums of IOCS data produce cost estimates consistent with trial balance accrued costs by quarter. For carriers, tally cost weights are developed only for readings conducted from Monday to Saturday.

Inputs are:

- IOCS tally files that were output from program ALB080;
- List of finance numbers with corresponding CAG group/Finance group codes;
- List of finance numbers with updated CAG and weighting factors;
- Files of Post Office accrued expense data by craft and CAG group;
- Periodicals tallies after external review;
- International tallies after external review;
- Edited tallies from external review of barcode scans;
- Edited tallies from external review of anomaly log;
- Sampling rate data used in sample selection for regular offices;
- Sample rate data used in sample select for heavy/light offices;
- Tallies of supervisors with automatically coded activity codes.

Outputs are:

- IOCS tally files with cost weights assigned and with edits and automatically assigned activity codes incorporated;
- File of dollar values by shape for products with mixed mail costs distributed in ALB103.

ALB103 - Program

SAS program, ALB103 is executed to 1) generate IOCS records representing counted mixed mail for counted items and 2) add detailed international activity codes.

Inputs are:

- IOCS tally file from ALB101;
- Detail data records for counted mixed mail;
- Costs by product and shape from ALB101.

Outputs are the IOCS tallies with additional records for counted mixed and with additional detail for international tallies. This output is in SAS and flat files.

ALB104 – Program

This program adjusts the cost weights for carrier tallies using TACS workhours by route group, craft group and CAG group. CAGs with any empty cells, with no tallies, are automatically grouped with data from other CAGs that do have data available. A separate cost pool is generated for Sundays and holidays.

Inputs are:

- IOCS tally file from ALB103;
- Summary file of TACS workhours from program CAGTACS;
- Files of Post Office accrued expense data by craft and CAG.

Outputs are the IOCS tallies with adjusted cost weights, in SAS and flat files.

ALB106 - Program

This program reformats and summarizes the IOCS tally data into the form required by the CARMM procedure. It also produces several craft level reports for input into CRA spreadsheets.

The summary output file drops basic function 4 records, then summarizes tallies and dollars for groups defined by CAG group, Finance grouping, craft code designation, operation/route code, basic function, and activity code.

CS2SUPV - Program

This program produces a report on split supervisor activity codes. The results are input to the C/S 2 spreadsheets.

- There are two analyses of activity code 7470 (supervision of mixed clerk/mail handler activities). The first reports on certain activities that should *not* be included—i.e., carrier activities (Q15D), other craft-level employees (Q15F), and no craft-level employees (Q15G). If none of these are found, “NO OTHERS” will be 100.0 percent. The second analysis is used to reallocate a portion of 7470 to mail processing, window, and administrative activities (Q15E1, Q15E3).
- An analysis of activity code 7635 (supervision of two or more clerk/mail handler activities) verifies that very few tallies include administrative/other activities (Q15E1) or other craft-level employees (Q15F).
- There are two analyses of activity code 7637 (supervision of clerks/mail handlers and at least one carrier). The first analysis determines the proportions of the various activities assigned to mail processing, window and admin (Q15E1, Q15E3, Q15F, Q15G). The second analysis narrows the mail processing activities to bulk mail acceptance, collection/preparation, processing/distribution, and miscellaneous (Q15E1).

CS3EQUIP - Program

This program develops distribution keys for mail processing equipment and training. The program selects all tallies for which:

- Employee is a clerk or mail handler
- Employee is assigned a direct mail activity code
- Employee is in a mail-processing related operation

The selected records are divided into types of equipment being used, type of manual operation being performed, NDC, parcels, and other mail processing activities. They are then assigned to product based on activity code, and reports are written.

ALBCARMM - Program

The function of the City **Carrier Mixed Mail** (CARMM) Cost Distribution program is to distribute mixed mail costs to direct mail activity codes and to produce a variety of summary reports as output. The inputs are: 1) cost data summarized by ALB106; 2) a table mapping direct mail activity codes to mixed mail codes.

APPENDIX A: IOCS ZIP FILE CONTENTS

The associated zip file contains the following.

1. Directory Data\ contains the IOCS dataset, both a PC-SAS dataset, PRCPub19.sas7bdat, and a flat file, PRCPub19Flat.dat, and a macro to read the flat file, PRCPUB19_FLTFMT.txt.
2. Directory SASPrograms\ contains the SAS programs used to assign activity codes, basic function and operation/route numbers, and to estimate costs.
3. Directory JCL\ contains the JCL used to run the SAS programs.
4. Directory ALB\HQ624D01\ contains the total dollars by craft and CAG that are distributed by IOCS.
5. File IOCSDataDictionaryFY19.xls describes the variables in the IOCS data files.
6. File MASTER.CODES.FY19 is a list of codes used in IOCS.
7. File FY19.MXMAIL.DATA is the mapping of direct to mixed mail activity codes for CARM.
8. File ReadPRCPubOutput19.txt is the output of a program that lists the variables in the PRCPub19 dataset and prints the contents of 10 records.
9. File IOCSDataEntryFlowchartFY19.xls is the flowchart describing the CODES software survey instrument.
10. File "IOCS CVs FY19 Public.xlsx" has the IOCS CVs.
11. File "COD_Cost_Coverage_FY19.xlsx" provides the analysis of COD ordered by the Commission.⁴

Note: The data file contains data elements of the IOCS data file used for the development of the Fiscal Year 2019 CRA. It was developed by dropping variables not used in development of the CRA, and recoding variables containing sensitive information.

The following data fields were recoded:

- F1 – the second character of F1 (area identifier);
- F2 – finance number;
- Q01 – employee identification number;
- NewFN – updated finance number.

The public datasets have been further modified by assigning activity code x475 to all domestic competitive products and x780 to all International products, and dropping variables that could identify these products.

⁴ FY 2016 Annual Compliance Determination (March 28, 2017), Chapter 3 at 62.